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On some applications of Cartan's generalization of Lie's Third Fundamental Theorem

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Lie's Third Fundamental Theorem asserts the existence of a Lie algebra whose structure constants are given, subject to the condition that the constants satisfy the Jacobi equation. Cartan generalized this theorem to an existence theorem for coframings whose structure functions (no longer constants) satisfy certain systems of partial differential equations. This result has not had the wide application that one might have expected, possibly because the result is not well known outside of the theory of exterior differential systems. In this lecture, I describe some applications of this theorem to problems in general relativity, CR geometry, prescribed holonomy and curvature problems, and so on.